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(54) Title of the Invention : Method to Produce the Leather- like Sheet Material

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Description

1. Title of the invention : Method to Produce the Leather- like Sheet Material

2. Scope of the Patent Application

Claim 1

Production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web (*this might mean 'filter cake', Translator*) comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and another fiber cloth are layered, is placed on the support body of which the surface is practically smooth, and the liquid rod-shaped flow that was ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2 is

applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the fiber cloth are intertwined, and the lamination is made into a single body.

Claim 2

Production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and the cloth that is made out of a potentially shrinkable fiber, are layered, is placed on the support body of which the surface is practically smooth, and the liquid rod-shaped flow that is ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2 is applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the fiber cloth are intertwined, and the lamination is made into a single body, and thereafter, the shrinking treatment is performed.

Claim 3

Production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and the cloth that is made out of highly shrinkable poly ethylene terephthalate fiber that has latent self elongating ability, are layered, is placed on the support body of which the surface is practically smooth, and the liquid rod-shaped flow that was ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2 is applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the fiber cloth are intertwined, and the lamination is made into a single body, and thereafter, the shrinking treatment is performed, and then self elongation treatment is performed.

Claim 4

Production method for the leather- like sheet material in which the extremely fine short

fiber web is directly applied on the fiber cloth to form the lamination, as described in Claims 1 to 3.

Claim 5

Production method for the leather- like sheet material in which the fiber forming type polymer is (wet?, *illegible*)-spun by using a spinning metal mouth piece made out of metal fiber sheet sintered plate with a filtration accuracy (*the Japanese text says 'accuracy', but they probably mean 'size range, Translator'*) of 15 μ or higher, and this is cut, and the obtained short fibers are used as the extremely fine short fibers, as described in Claims 1 to 4.

Claim 6

Production method for the leather- like sheet material which uses the short fibers that were obtained by cutting after super drawing poly ethylene terephthalate undrawn yarn, or by cutting after ordinary drawing that is done after super drawing, as the extremely fine short fibers, as described in Claims 1 to 4.

Claim 7

Production method for the leather- like sheet material which uses the short fibers that were obtained by dissolution- removal of the sheath component of the multi- core composite fiber that is comprised of 2 polymers of different solubilities before or after cutting, as the extremely fine short fibers, as described in Claims 1 to 4.

Claim 8

Production method for the leather- like sheet material which uses the short fibers that were obtained by dissolution- removal of one polymer component of the mixed spun fiber that is comprised of 2 polymers of different solubilities before or after cutting, as the extremely fine short fibers, as described in Claims 1 to 4.

Claim 9

Production method for the leather- like sheet material which uses the short fibers that

were obtained by splitting the easily splitable composite fibers that are comprised of 2 polymers that have low miscibility with each other by mechanical action and / or the action of a swelling agent before or after cutting, as the extremely fine short fibers, as described in Claims 1 to 4.

Claim 10

Production method for the leather- like sheet material in which the fiber length of the extremely fine short fibers is 1 to 10 mm, as described in Claims 1 to 9.

Claim 11

Production method for the leather- like sheet material in which the liquid ejection treatment is performed by setting the distance between the orifice exit and the extracted web surface to be 1 to 15 cm, as described in Claims 1 to 10.

Claim 12

Production method for the leather- like sheet material which uses a metal roll as the support body with a smooth surface, as described in Claims 1 to 11.

3. Detailed Explanation of the Invention

This invention relates to the method to produce the sheet- like material that has the feel and touch of natural leather.

In order to obtain the feel and touch of natural leather, especially to obtain that of swede, it is essential to produce the sheet- like structure from the fibers of generally 0.5 denier or less. By using such extremely fine fibers, for the first time the sheet that has a specific 'sliminess' that is similar to that of natural leather and the so called lighting effect, can be obtained.

However, it is extremely difficult to make these extremely fine fibers directly into a sheet. For example, when the short fibers of 0.5 denier are applied on the card in an attempt to

form the web, almost all of the said short fibers sink to the center of the card and do not come out, and, practically, it is impossible to form a web.
In order to avoid the difficulty of directly forming the web of extremely fine fibers like this, other methods have been suggested too in which the short fibers that consist of the composite fibers of which the single fiber denier is relatively large, is made, and the web is formed with this, and thereafter, either each composite component is split, or one composite component is removed by dissolution, and thus the unwoven fabric that is comprised of short fibers of which the single fiber denier is small, is produced.

However, in the method in which the fine denier fiber is obtained by splitting the composite fiber, the splitting will be limited practically, and at most splitting into 5 parts is the upper limit, therefore, it is difficult to obtain the fibers of fine denier. Namely, even if the composite fibers of 1.0 denier which is considered to be almost the lower limit denier considering the passing ability of the carding machine, is used, the denier of the fine fibers that can be obtained by splitting treatment is only 0.2 denier, and it is practically impossible to obtain finer fibers than this. Therefore, the diversity of quality of the sheet that can be obtained from the fine fibers obtained by this will be naturally limited, and it is extremely difficult to industrialize this method.

Also, in the method in which the sheet is made out of a sheath core composite fiber which has a multi- core structure by normal methods, and where the said sheet is treated with an agent that dissolves or decomposes the sheath component to remove the sheath component, the sheet that is made out of extremely fine fibers of approximately 0.01 denier, can be obtained. However, when the sheath component is removed in this method, the sheet structure becomes extremely coarse. For instance, even if the card web of composite yarn is made dense by needle punching and the sheet with an apparent density of 0.40 g / cm^3 is obtained, if 50 % of it is soluted out, the apparent density of the finally obtained sheet becomes 0.20 g / cm^3. Considering that natural leather normally has an apparent density of 0.50 g / cm^3 , the touch and feel of the sheet obtained by the sheath component dissolution- removal treatment of the composite fibers is obviously insufficient compared with that of natural leather.

Therefore, attempts to densify the extremely fine fiber sheet that has a coarse structure by post treatment has been tried too, but this is not yet satisfactory. For instance, if the needle punch treatment is applied once more, the apparent density of the sheet increases, but the extremely fine fibers are damaged by the needle, and the surface of the sheet becomes fuzzy and the appearance is greatly damaged.

As another method, the coarse, extremely fine fiber sheet can be shrink- treated to densify it, but normally, the core component polymer has shrunk already during the time of dissolving the sheath component polymer, therefore, the shrinkage of the said extremely fine fiber sheet is relatively small, and the densification of the sheet by shrinking treatment can not be expected to do much.

In order to improve on these disadvantages, it is considered to be essential to use an extremely fine fiber sheet as the composite body with the elastomer resin, but this naturally restricts the diversity of the quality of the said sheet. Namely, since the elastomer resin enters into the fiber structure, the feel and touch of the obtained sheet will inevitably include that of the resin, and the draping ability decreases also. Therefore, the usage of the said sheet will be limited in the fields where the draping ability is important.

As was mentioned above, in the existing technology for producing a swede- like sheet material, the biggest problem is the lack of the diversity of the quality of the obtained product , and this inevitably narrows the range of the product usage, and this is extremely disadvantageous economically.

The inventors thought that this problem exists due to the immature nature of the technique for forming the sheets of extremely fine fibers. Namely, in the existing technology for producing swede- like sheet material, the development of the production method for extremely fine fibers was heavily involved, and new technology has not developed at all for the methods of forming the sheet.

This invention relates to the production method for the leather- like sheet material in which the disadvantages of the existing method were eliminated, and the summary of the first invention is the production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and another fiber cloth are layered, is placed on the support body of which the surface is practically smooth, and the liquid rod-shaped flow that was ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2 is applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the fiber cloth are intertwined, and the lamination is made into a single body.

The summary of the second invention is the production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and the cloth that is made out of a potentially shrinkable fiber, are layered, is placed on the support body of which the surface is practically smooth, and the liquid rod-shaped flow that was ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2 is applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the cloth are intertwined, and the lamination is made into a single body, and thereafter, the shrinking treatment is performed.

The summary of the third invention is the production method for the leather- like sheet material characterized by the fact that the laminated body where an extracted web comprised of extremely fine short fibers of which the single fiber denier is 0.5 denier or less and the cloth that is made out of highly shrinkable poly ethylene terephthalate fibers that have latent self elongation ability, are layered, is placed on a support body of which the surface is practically smooth, and the liquid rod-shaped flow that was ejected from an orifice with a hole diameter of 0.06 to 1.0 mm at a pressure of 5 to 35 kg / cm^2

is applied from the extracted web side, and by this, the extremely fine short fibers of the extracted web and the structural fibers of the fiber cloth are intertwined, and the lamination is made into a single body, and thereafter, the shrinking treatment is performed, and then the self elongation treatment is performed.

Next, this invention will be explained in further detail. Concerning the method for producing the laminated body of the extremely fine short fiber web and other fiber cloth, a web that was made by extracting the extremely fine short fibers, and a separately prepared fiber cloth may be laminated too. However, the method in which the extremely fine short fibers are dispersed in a liquid, and the said dispersed liquid is extracted directly by the other cloth to form the lamination, is especially preferred.

By these methods, the extremely fine short fibers become laminated with the other cloth and it can be formed into a sheet easily, and the extremely fine short fiber web obtained by the wet extraction is relatively dense, and it is convenient for the case of producing the natural leather- like sheet material as in this invention.

The extremely fine short fibers that are used in this invention can be produced by the various methods listed below. Namely:
(i) The method in which a fiber forming polymer is wet spun by using a spinning mouth ring made out of a metal fiber sheet sintered plate of which the filtration accuracy is 15 μ or higher, and it is drawn and cut.
(ii) The method in which a poly ethylene terephthalate undrawn yarn is super drawn and thereafter it is cut, or it is cut after additionally performing ordinary drawing after super drawing.
(iii) The method in which the sheath component of a multi- core composite fiber that is comprised of 2 kinds of polymers of which the solubilities are different, is dissolution-removed before or after cutting, as described in Patent Kokoku No. S43-7411.
(iv) The method in which one polymer component of a mixed spun fiber that is comprised of 2 kinds of polymers of which the solubilities are different, is dissolution-removed before or after cutting, as described in Patent Kokoku No. S40-2791.

(v) The method in which the easily splitable composite fibers that are comprised of 2 kinds of polymers of which the miscibility with each other is low, is split by mechanical action and / or the action of a swelling agent, before or after cutting, as described in Patent Kokoku No. S48-28005.

For the selection of the fiber length of the extremely fine short fibers, the dispersing ability into the liquid during the extraction process, the extraction ability and the feel and touch of the obtained product, etc., must be considered.

Namely, the longer the fiber length is, the more the ability to disperse uniformly tends to decrease, however, the intertwining ability between the fibers by the jet flow treatment improves, and that helps the post working of the product, for instance, the dropping off of extremely fine short fibers during the napping treatment can be restricted, and in addition, the properties related to feel and touch such as 'sliminess', lighting effect, etc., of the obtained product can be varied.

Also, if the fiber length is short, the dispersing ability of the extremely fine short fibers in the liquid in the extraction process improves and the extraction becomes relatively good, but on the other hand, the intertwining ability between the fibers by liquid jetting decreases, and the dropping off of the extremely fine short fibers from the obtained product becomes worse, and also the touch and feel of the product becomes restricted due to the short nap.

Considering the ease of production and the performance of the product described above, the fiber length of the extremely fine short fibers should be in the range of 1 to 10 mm, however, to be concrete, the appropriate fiber length varies depending on the single fiber denier. For instance, the range of the suitable fiber length of the extremely fine short fibers of 0.5 denier is 2 to 10 mm, the range for the extremely fine short fibers of 0.2 denier is 2 to 5 mm, the range for the 0.05 denier fiber is 1 to 3 mm, and it is 1 to 2 mm for the extremely fine short fibers of less than 0.05 denier.

The extremely fine short fibers obtained like this are dispersed in the liquid to be used, and that liquid is usually water. Of course, any liquid can be used as long as it is not a solvent for the fiber polymer. In the case of using water, the fiber concentration in the water is normally 0.001 % to 0.05 %, and if the concentration is higher than this, the fibers that are dispersed in the water become tangled up, and the uniform extraction is difficult to perform, and the quality of the texture of the obtained web becomes poor.

The dispersed liquid of the extremely fine short fibers obtained like this is extracted into the web in the next process, and then in the following process, it is laminated with another cloth. But, as was mentioned above, this 'paper making process' and the laminating process can be done as a single procedure too. Namely, during the time of extracting the dispersed liquid of the extremely fine short fibers, if another cloth is present between the metal mesh used for the extraction and the dispersed liquid, the lamination of the extremely fine fiber web and the cloth can be obtained.

The fiber cloth to be laminated with the extremely fine short fiber web can be anything as long as its structure is relatively stable such as (knit? *illegible*), woven material, un-woven material, etc., and by appropriately selecting the said cloth, a wide range of diversity can be given to the characteristics and performance of the final product.

Namely, if the cloth of which the apparent density is high and the "metuke"? (the *meaning of this word is uncertain, but it may mean 'weight', Translator*) is also large is used, when the lamination of the extremely fine short fiber web and cloth is treated by the jetted liquid that will be described later, the extremely fine short fibers will not penetrate the cloth, and they will intertwine only with the structural fibers of one side of the said cloth, therefore, the obtained sheet becomes the sheet that has the extremely fine short fiber layer only on one side.

On the other hand, if the cloth of which the apparent density is relatively low and the "metuke" is also small is used, when the lamination of the extremely fine short fiber web and the said cloth is treated by the jetted liquid, a part of the extremely fine short fibers

penetrates the cloth by the action of the jetting liquid, and it reaches to the surface of the opposite side of the said cloth, therefore, the obtained sheet will have an extremely fine short fiber layer on both sides of the sheet.

If the cloth that has latent shrinkability is used, when the composite sheet in which the extremely fine short fibers and the said cloth are intertwined into one body, is treated under the conditions in which the said sheet shrinks, for example, treating with heat or with a swelling agent, the composite sheet shrinks and becomes densifyed, therefore, the extremely fine short fibers distribute in the cloth at a higher density, and the features that are similar to those of natural leather, such as 'sliminess' or lighting effect, can be displayed more effectively.

By the way, the composite sheet obtained by using the cloth that has a high degree of shrinkage, often becomes stiff, and its draping ability is impaired slightly. At such time, the structure of the composite sheet that is shrunk should be loosened once slightly, then, the composite sheet which is soft and has excellent draping ability can be obtained. For this purpose, the cloth that was structured from highly shrinkable poly ethylene terephthalate fiber that has latent self elongation ability, can be used. This highly shrinkable poly ethylene terephthalate fiber that has latent self elongation ability can be easily produced by, for instance the method disclosed in Patent Kokoku No.S37-7919, to be concrete, when it is treated with 70 °C warm water for 5 minutes, it shrinks 50 %, and thereafter, if this shrunken yarn is treated in boiling water at 100 °C, it elongates 15 %, even without tension.

If the composite sheet in which the cloth made out of the fiber which has such nature and the extremely fine short fibers are intertwined into a single body, is treated with warm water at 70 °C, the said composite sheet shrinks by about 50 %, and it becomes the sheet that has a stiff feel, but continuously, when it is treated with boiling water, the said sheet elongates by about 15 %, and also the feel becomes much softer, and if this is further set by an iron at 140 °C, the composite sheet that has an even softer feel can be obtained, and in addition, an extremely high level of 'sliminess' can be added since

the extremely fine short fibers exist and they are distributed densely on the surface layer of the said composite sheet.

In the method of directly obtaining the lamination of the extremely fine short fiber web and cloth, the selection of the characteristics of the said cloth must be considered especially carefully.

Namely, since the cloth is directly used for extraction, the cloth of which the "metuke" and density are large is not as preferred, since the ability for filtering the liquid decreases. Therefore, normally, the woven material, (knit? *illegible*) , unwoven material of which the "metuke" is 300 g / $m^{2?}$ or less, and with an apparent density of 0.3 or less, is used.

However, in the case when such cloth is used, the "metuke" and the density of the obtained product are restricted low and the range of the feel and performance of the product will be inevitably restricted. Therefore, in the case of a demand to obtain a high density product, it is recommenced to use the cloth that has latent shrinking ability.

In the case when a shrinkable cloth is used, at the point in the time of the extraction, the cloth has a low "metuke" and a low density, therefore, the extraction speed can be made larger. On the other hand, after extraction, the lamination of the extremely fine short fibers and the cloth is jet- treated and they are made into a intertwined single body, and thereafter, if it is shrink-treated by heat or a swelling agent, the "metuke" and the density of the obtained composite sheet increase corresponding to the shrinkage, therefore, it is possible to obtain a composite sheet that has a wide range of values of the "metuke" and the density, by regulating the shrinkage of the cloth.

In this invention, the extremely fine short fiber web and the fiber cloth are made into a single body by liquid jetting treatment.

In the liquid jet treatment, the liquid is directly jetted onto the lamination that was placed

on the support member such as a net or roll. In this case, anything can be used as the support member as long as its surface is smooth so that the pattern of the support member is not formed on the lamination practically, and also, the liquid that was jetted can be removed quickly.

Also, in the case of treating on a net, if suction is utilized, the water can be removed more effectively.

In the case when the ups and downs on the support member are large, a pattern will be formed on the lamination by the liquid jetting, and in that case, its usage will be limited, and the general use cloth can not be obtained, so that it is not preferred in this invention.

Also, the liquid that was jetted must be removed quickly from the lamination, and if the liquid remains partially in the lamination, the effect of making a single body by intertwining by liquid jetting becomes small in the area where the liquid remains, and also an obvious unevenness will occur. If most of the liquid remains in the lamination and it becomes in the state where the lamination is submerged in the liquid, the effect of making a single body by intertwining using liquid jetting can no longer recognized, and further, the extremely fine short fibers will separate from the lamination and solute out. Therefore, the liquid that was jetted must be removed quickly from the inside of the lamination.

The liquid used for the liquid jetting treatment can be anything as long as it is not a solvent for the treating fiber, however, water or warm water is suitable for the ease of handling. A small amount of additive can be added into the liquid too to increase the effect of the liquid jetting. This has been known as the 'Toms' effect, and this utilizes the phenomenon where the turbulent flow friction loss of the flow movement inside the nozzle can be greatly reduced by adding a small amount of additive into the liquid. In the case when water is used as the liquid, poly ethylene oxide, poly acrylic amide, etc.,

can be used as this additive at a concentration of several tens to several hundreds of ppm.
The shape of the jet liquid should be preferably a narrow rod-shaped flow, and the hole diameter of the jetting nozzle should be normally 0.06 to 1.0 mm, preferably 0.1 to 0.3 mm.

The pressure of the liquid that is used should be normally 5 to 35 kg / cm^2, but this varies depending on the web treating speed, and the appropriate pressure becomes higher when the treatment speed becomes higher. If the pressure is too low, the sufficient intertwining effect can not be obtained, and conversely, if the pressure is too high, not only it is disadvantageous economically, but also the scars from the liquid treatment sometimes remain, or the form of the extremely fine short fiber layer is destroyed, and the appearance is greatly impaired, so this is not preferred.

The distance between the jetting exit and the web should be 1 to 15 cm. If the distance becomes large, air enters into the jetted liquid, and the effect of making it into a single body by intertwining decreases.

The method to produce the unwoven fabric by liquid jet treatment, or the method to produce the composite structure of the unwoven fabric and ordinary woven fabric, are disclosed in Patent Kokoku No. S47-18069 or Patent Kokoku No. S48-13749, however, the purpose of conducting the liquid jet treatment is basically different from that in this invention. Namely, the purpose of the liquid jet treatment performed in the production of the composite sheet- like material of this invention, is to cause the extremely fine short fibers laminated on the cloth which already has a stable structure to intertwine with the fibers that construct the said cloth, to make the extremely fine fiber layer and the cloth fiber layer into a single body, and to intertwine each of the extremely fine short fibers in the extremely fine short fiber web to each other does not have any meaning here. On contrary, the objective of the above mentioned two patents is to strongly intertwine each of the structural fibers of the un- treated web to each other.

The difference in the objectives of the liquid jet treatment naturally means the difference in the said treatment method, and to be concrete, the following three different points can be listed.

Namely, the first different point is, in this invention, the liquid jet treatment is utilized to obtain the effect of making the fiber cloth layer that becomes the base body and the extremely fine short fiber layer into a single body, therefore, the generation of the sewing marks or special patterns or the opening part on the surface of the sheet material must be avoided since these impair the appearance of the obtained sheet, therefore, as an essential for this purpose, the jet pressure of the liquid must be limited to the range of 5 kg / cm^2 or higher but 35 kg / cm^2 or lower. If the liquid jet treatment is done at a higher pressure that exceeds 35 kg / cm^2, the clear and strong sewing lines appear, so it is not suitable for this invention.

The second point of difference is that the liquid jet treatment in this invention requires the practically smooth board- like material or roll- like material to support the lamination, and even in the case of using a net- like material, it is necessary to use one with a dense structure which is 100 mesh or higher and with a hole area ratio of 10 % or less. On the other hand, in the above mentioned 2 patents, the situation is totally the reverse of this, and a plate with open holes or a screen is used to support the web, and the fiber group is pushed into the holes or grooves that the said support body has to intertwine it, and this is the basic structure of these methods, therefore, a special porous plate or a coarse screen of 80 mesh or less must be used.

The third point of difference is that it is essential to use the knit, woven fabric or unwoven fabric with a stable structure that has excellent mechanical properties and excellent feel as the cloth used in this invention. Namely, in this invention, the cloth layer and the extremely fine short fiber layer are made into one composite body by liquid jet treatment, and the objective is to change the feel and touch of its surface to be that of the extremely fine short fibers, and giving strength to the obtained sheet is not the objective of this invention. Therefore, in order to secure the strength and feel of the

obtained composite sheet- like material, it is necessary to use the cloth with a stable structure in which the strength and feel are already secured.
However, in the above mentioned 2 patents, the ordinary fiber cloth to be composited with the web is simply a supplement for producing the unwoven fabric with secured strength.

As is clear from the above explanation, the basic structure of this invention is the lamination of the extremely fine short fiber web and another fiber cloth and the subsequent liquid jet treatment, however, the above mentioned process can be repeated too. Namely, the composite sheet- like material obtained in the above mentioned process can be laminated again with an extremely fine short fiber web, and if the liquid jet treatment is performed again for this, the composite sheet- like material in which the proportion of extremely fine short fibers is larger in the sheet can be obtained.

The composite sheet- like material that became a single body can be directly dried, or in the case when a shrinkable sheet is used as the sheet material, it can be dried after the shrinking treatment is performed as was mentioned above. If necessary, the extremely fine short fiber side may be napped after thermal setting.

In this invention, the natural leather- like sheet material can be produced from only fiber, and compositing it with resin is not fundamentally necessary.

Namely, the leather- like sheet material of this invention is obtained by intertwining the extremely fine short fibers and the general fiber cloth into a single body, therefore, the touch and feel of the sheet becomes like that of the natural leather as a result of the extremely fine short fibers, and the mechanical properties of the sheet such as strength or elongation, etc., can be regulated freely by the nature of the cloth that is used. For instance, if the knit or woven material is used, the sufficient performance for apparel usage can be given.

The feel and touch can be regulated freely by the nature of the cloth too. Namely, the existing artificial leather for apparel usage is a composite of the extremely fine short fibers and an elastomer resin, therefore, its feel lacks in the draping ability due to the resin, however, in this invention, the cloth that has excellent draping ability and the extremely fine short fibers are made into a composite, therefore, the natural leather- like sheet with excellent draping ability can be produced.

In addition, in the sheet material of this invention, the thickness can be controlled freely. Namely, the thickness of the existing artificial leather for apparel usage used to be 0.5 mm or greater, and the sheets that were thinner than that used to be difficult to make in reality, however, in this invention, the sheet thickness of the product can be freely regulated by regulating the thickness of the fiber cloth that is used, and it is easy to offer the leather- like sheet material of which the thickness is less than 0.5 mm too.

Next, this invention will be explained more concretely referring to actual examples.

Actual Example 1.

An acrylonitrile type co-polymer which included acrylonitrile at 92 wt % and vinyl acetate at (7? *illegible*) wt %, and of which the ultimate viscosity measured in di-methyl formamide at 25 °C was 1.7, was dissolved in di-methyl acetamide, and the solution in which the polymer concentration was 16 wt % was prepared, and this solution was wet-spun into a 35 °C aqueous solution of 60 wt % di methyl aceto amide at a take-up speed of 5 m / min using a spinning mouth piece which was such that stainless steel fiber was sintered as (?? *illegible*), and a "Ball? filter ridge mesh sheet" (a product of Ball? Trinity Micro Co.) with a filtration size of 5 μ, are stacked in 2 layers. Subsequently, it was drawn to 3 X in boiling water, and the extremely fine fiber tow of which the average single fiber denier was 0.1 denier, the total denier was 4200 denier was obtained.

This tow was cut into 3 mm sections and these were dispersed in water, and thus the dispersed liquid that contained a fiber concentration of 0.01 wt %, was made.

On the other hand, (knit? *illegible*) material of which the "metuke" was 120 g / m^2 was made from wooly processed yarn made of acrylic fiber filament 180d / 60 f, and the above mentioned extremely fine short fiber dispersed liquid was extracted with this cloth, and thus, the composite body in which the acrylic extremely fine short fiber web was laminated on the acrylic filament processed yarn (knit?, *illegible*) material, was obtained.

The said composite body was placed on a 200 mesh metal screen, and the water flow jet treatment was done from the acrylic extremely fine short fiber web side. The water flow was jetted using a liquid jetting nozzle with a hole diameter of 0.15 mm and a distance between the holes of 1 mm, at a pressure of 25 kg / cm^2 G. The distance between the jet nozzle and the web was 4 cm, and the metal screen on which the web was placed was moved at a speed of 5 m per minute. Next, the said web was guided onto a 20 cm diameter metal roll, and the water flow was jetted from a height of 4 cm above the web using the same nozzle at a pressure of 30 kg / cm^2 G. When it was dried, the composite sheet- like material of which the "metuke" was 172 g / m^2 was obtained. As the result, 52 g / cm^2 of an extremely fine short fiber web was laminated on the said composite sheet. The obtained composite sheet- like material was covered with the extremely fine short fibers on its surface, therefore, it was the sheet that has good 'sliminess' and good appearance and the feel of natural leather.

Actual Example 2

Needle punch unwoven fabric with a "metuke" of 100 g / m^2 was made out of poly ethylene terephthalate short fibers of 2 den x 50 mm that had a boiling water shrinkage of 32 %, and this was used to extract the dispersed liquid of the acrylic extremely fine short fibers that were used in Example 1, and the water flow jet treatment was done the same as in Example 1. When the obtained composite sheet was treated in boiling water for 15 minutes, the said sheet shrunk by 30 % (*it is not clear in this sentence whether they mean shrunk by 30% or shrunk to 30%, Translator*), and the "metuke" became 290 g / m^2, and the feel of natural leather was imparted.

Actual Exampl 3.

Poly ethylene terephthalate of which the intrinsic viscosity measured in 30 °C ortho chloro phenol was 0.64, was melt- spun by the ordinary method, and the undrawn yarn of which the single fiber denier was 3 denier and the total denier was 600 denier was obtained. The said undrawn yarn was drawn to 8 X in warm water at 80 °C, and consecutively it was drawn to 2 X between an 80 °C roller and a room temperature roller, and thereafter, it was thermal- set at 120 °C, and after it was cut into lengths of 3 mm, it was dispersed in water, and the dispersed liquid in which the fiber concentration was 0.007 % was prepared.

On the other hand, the same poly ethylene terephthalate was spun at 1800 m / min, and thereafter, it was drawn to 2 X between the supply roll at 80 °C and the drawing roll at room temperature, and the denier of this was 75d / 36f and the shrinkage in 70 °C warm water was 60 %. Consecutively, it was treated in boiling water and the elongation ratio was 12 %, thus the highly shrinkable fiber that had latent self elongation ability was obtained.

Knit material was made from this fiber, and the (dispersed liquid? *not indicated*) was directly extracted by the said knit and the lamination was obtained, and this lamination was treated by the water jet the same as in Example 1, and consecutively it was treated in warm water at 70 °C for 5 minutes. As the result, the knit obviously shrunk, and the sheet with quite a stiff feel was obtained. This sheet was treated in boiling water for 30 minutes, and it was dried, and thereafter it was iron- set at 140 °C, and an extremely soft sheet was obtained, and in addition, its surface had the 'slimy' touch and feel of natural leather.

Actual Example 4.

Poly ethylene terephthalate with an intrinsic viscosity measured at 30 °C in ortho chloro phenol of 0.65, and Nylon 6 with an intrinsic viscosity measured at 30 °C in meta cresol of 1.21, were each separately melted at 280 °C and 270 °C, and thereafter, it was multi-core- composite - spun at a weight ratio of 30 : 70 at 280 °C, and the multi- core composite fiber that was comprised of 13 strands of poly ethylene terephthalate core and

a sheath part of nylon 6 was obtained, and the said fiber was cut into 2 mm lengths, and it was treated with formic acid and the nylon 6 was soluted out. As the result, poly ethylene terephthalate, extremely fine short fibers of 0.12 den x 2 mm length were obtained. These extremely fine short fibers were dispersed in water, and the extremely fine short fiber dispersed liquid in which the fiber concentration was 0.008 % was obtained.

On the other hand, the highly shrinkable poly ester that has latent self elongation ability that was prepared in Example 3 was bundled into a tow of 50,000 denier, and thereafter, it was shrink-wound by normal methods, and it was cut, and it was made into a staple of 2.1 den x 50 mm, and from the said staple, the needle punch unwoven fabric was formed by the normal method. The said unwoven fabric had a "metuke" of 82 g / m^2 and an apparent density of 0.15 g / cm^3. The dispersed liquid of the above mentioned extremely fine short fibers was extracted by this unwoven fabric, and the lamination was formed, and thereafter the liquid jet treatment was done. Water that included 200 ppm of poly ethylene oxide was used as the liquid, and the liquid was jetted using a jet nozzle with a hole diameter of 0.25 mm and a distance between holes of 2.0 mm under a pressure of 30 kg / cm^2 G. The distance between the jet nozzle and the web was 5 cm, and the 150 mesh metal screen on which the web was placed was moved at a speed of 8? m / min.

When the obtained composite sheet was treated in warm water at 70 °C for 15 minutes, the sheet shrunk obviously, and a quite stiff sheet was obtained. This sheet was treated in boiling water for 30 minutes, and after it was dried, it was thermal set at 140 °C, and as the result, an extremely soft sheet was obtained, and its surface was just like that of natural leather with good 'sliminess'.

Actual Example 5.

A mixed spun fiber comprised of 40 parts of Nylon 6 and 60 parts of poly styrene, was cut into 2 mm lengths, and the poly styrene was soluted out by toluene treatment, and thus, extremely fine short fibers of nylon 6 of which the average single fiber denier was 0.02 denier were obtained. These extremely fine short fibers were dispersed in water,

and the dispersed liquid in which the fiber concentration was 0.005 wt %, was made, and it was extracted on a metal screen and the web which had a "metuke" of 62 g / m^2 was obtained.

On the other hand, a thin knit was made from nylon processed yarn 75d / 36f, and this knit and the above mentioned web were laminated, and then the water flow jet treatment was done. In the water flow jet treatment, the water flow was jetted from a jet nozzle with a hole diameter of 0.20 mm and an inter- hole distance of 1.5 mm, under a pressure of 30 kg / cm^2 G. The distance between the jet nozzle and the web was 3 cm. The 150 mesh metal screen on which the web was placed was moved at a speed of 3 m / min.

This liquid jet treatment was performed twice each in the length and the width directions of the lamination, and it was dried. As the result, the extremely fine short fibers existed on both sides of the knit fabric, and both sides had the touch and feel of natural leather.

Actual Example 6

An easily splitable composite fiber which was comprised of 50 parts of Nylon 6 and 50 parts of poly ethylene terephthalate and which had a cross section divided into 4 equal parts, was spun, and thereafter, it was drawn to 2.2 times, and thus, the easily splitable composite fibers of which the single fiber denier was 1.2 den were obtained. The said composite fibers were cut into 3 mm lengths, and when it was treated with benzyl alcohol at 80 °C, the boundary of the Nylon 6 and the poly ethylene terephthalate was almost separated, and extremely fine short fibers of 0.3 denier were obtained. The said extremely fine short fibers were washed with methanol and then with water, and thereafter, they were dispersed in water, and the dispersed liquid for extraction in which the fiber content was 0.01 wt % was made, and it was extracted on a metal screen, and the wet web was obtained. This wet web and the needle punch unwoven fabric that was made from the highly shrinkable poly ester fiber that was prepared in Example 4 and that has latent self elongation ability, were laminated, and the same liquid jet treatment and heat treatment that were used in Example 4 were performed. As the result, the soft

composite sheet- like material that had the feel and touch of natural leather was obtained.

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